

**1. Module details**

**Module name**

**Electrical Wiring and Equipment 2**

**Suggested structured learning time**

A learner possessing the prerequisite skills and knowledge should achieve the module purpose in 36 to 40 hours.

**Module code**

NE173.1

**Discipline code**

0703101

**2. Module purpose**

This module further develops knowledge and skills in the installation of wiring systems and equipment and the associated Wiring Rules and Regulations.

Learners will install TPS and TPI cable and a range of accessories including smoke detectors for circuits typical to a whole installation. Also, Learners will terminate wiring at accessories and equipment and wire components at a consumer's switchboard including an MEN earthing system.

The module includes elements of installation testing as an introduction to testing requirements covered in module NUE408

**3. Learning pathway**

**Intended use in the structured learning program**

This module is intended to supplement workplace exposure to electrical installation work. In particular it applies the application of regulator requirements for installing electrical wiring and equipment.

Therefore before undertaking this module a Learner should have a clear understanding and experience in the use of tools, fixing devices, accessories and cable termination and how the fundamental principles for safety apply.

**Recommended prerequisites**

For the most effective learning this module should be undertaken only after modules in NE172, NE175 and NUE062 have been completed and in conjunction with module NUE044.

**4. Relationship to competency standards**

This module provides part of the underpinning knowledge and skills in the 'Evidence Guide' of specific units of competency in the National Electrotechnology Training Package and provides similar support, where mapped, to equivalent units in the National Metals and Engineering Competency Standards. For details refer to the module to unit maps, available from EEQSBA.

This module support the development of essential capabilities required for electrical licensing.

## 5. Content

### 1. Circuit wiring - TPS cable

- Wiring Rules requirements for the installation of unenclosed flat TPS cables and accessories:
  - installation techniques in clad frame structures
  - single purpose and mixed final subcircuits
    - lighting switched from more than one point, or
    - power circuit supplying socket outlets
    - mixed circuits of lights, socket outlets, exhaust fans
- testing:
  - smoke detectors
  - earth continuity
  - insulation resistance
  - polarity

### 2. Circuit wiring - TPI cables

- Wiring Rules requirements for installation of TPI cables non-metallic enclosures and accessories:
  - connecting appliances to fixed wiring
  - separate final subcircuits
  - water heaters
  - cooking ranges
  - motors eg. Pumps
- testing
  - earth continuity
  - insulation resistance
  - polarity

3. Switchboard wiring
  - Wiring Rules and local requirements
    - for connection/wiring of switchboard equipment
    - earthing
    - connection of final subcircuits to control and protection devices and metering equipment
    - MEN earthing connection
4. Consumers mains
  - terminating hard drawn aerial cables
  - terminating consumers mains at a main switchboard

## **6. Assessment strategy**

### **Assessment methods**

Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.

### **Conditions of assessment**

Normally learning and assessment will take place in a formal learning environment.

## **7. Learning outcome details**

### **Learning outcome 1**

Install single purpose or mixed final subcircuits supplying lighting, exhaust fans and socket outlets using flat TPS cables.

### **Assessment criteria**

- 1.1 Given a simulated installation in a framed structure, install and connect circuits containing light points controlled by more than two switches with master on/off control, exhaust fans and socket outlets in accordance with Wiring Rules and local requirements.
- 1.2 Given a simulated installation install a smoke detector in accordance BCA and local requirements.
- 1.3 Test circuits to ensure they are safe to connect to the supply.

### **Learning outcome 2**

Install final subcircuits supplying appliances using unenclosed flat TPS cable and TPI cables enclosed in non-metallic trunking and conduit.

**Assessment criteria**

- 2.1 Given a simulated installation, install and connect circuits supplying water heating and cooking appliances in accordance with Wiring Rules and local requirements.
- 2.2 Given a simulated installation, connect appliances to fixed wiring using a socket outlet or non-metallic flexible conduit in accordance with Wiring Rules and local requirements.
- 2.3 Test circuits to ensure they are safe to connect to the supply.

**Learning outcome 3**

Connect final subcircuit wiring to switchboards and connect all switchboard equipment in accordance with Wiring Rules and local requirements.

**Assessment criteria**

- 3.1 Given the final subcircuit wiring of a simulated installation, connect the final sub-circuits to appropriate circuit control and protection devices at a switchboard in accordance with Wiring Rules and local requirements.
- 3.2 Given a simulated installation, connect the switchboard equipment in accordance with Wiring Rules and local requirements.
- 3.3 Given a simulated installation, install an MEN earthing system in accordance with Wiring Rules and local requirements.

**Learning outcome 4**

Connect consumers mains to an installation, in accordance with Wiring Rules and local

**Assessment criteria**

- 4.1 Terminate parallel webbed hard drawn copper aerial cable on a shackle insulator in accordance with Wiring Rules and local requirements.
- 4.2 Given the completed wiring of a simulated installation, install and connect the consumers mains via overhead consumers terminals in accordance with Wiring Rules and local requirements.
- 4.3 Given the completed wiring of a simulated installation, install and connect the underground consumers mains in accordance with Wiring Rules and local requirements.

**8. Delivery of the module**

**Delivery strategy**

Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective method to achieve this is by integration of theory and practice where Learners learn by experimentation, research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require a learning outcome sequence other than that indicated in the module.

**Resource requirements**

Resources should be sufficient for Learners to carry out exercises on an individual basis. This includes structures such as wall and ceiling framing, facilities for concealed and surface wiring and MEN earthing and switchboards.

Useful references include:

Pethebridge, K., and Neeson, I., 2001, *Electrical Wiring Practice*, 6<sup>th</sup> Ed, Vol.1& 2., McGraw Hill, Sydney.

Standards Australia, Standards New Zealand

*AS/NZS 3000:2000 Wiring rules*

*AS/NZS 4836 Safe working practice on low-voltage electrical installations*

*AS/NZS 3017 Electrical Installations – Testing guidelines*

Local electricity distributor and authority regulations

Where this module is used in an approved Traineeship or Apprenticeship program learners should be advised to obtain, where available, respective EEQSBA<sup>1</sup> **User Guides** (*these outline in detail what training and work performance the Learner is required to undertake for the program*).

**Occupational health and safety requirements**

A safe and healthy environment will be provided for learners and teachers. Safety procedures for the particular learning facilities shall be followed as part of the learning / teaching activity and assessment.

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<sup>1</sup> EEQSBA – ElectroComms and EnergyUtilities Qualifications Standards Body of Australia Ltd